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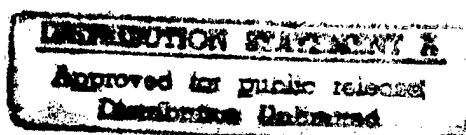
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M1A2s, Smart Ammunition, and Time and Space Theory

(Or, Why I Would Not Want To Be the Threat)

by Captain Mike Pryor

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As if simply reading about digital command and control (C2) enhancements was not enough excitement for one tanker to stand, along comes Major Bruce Held's March-April 1995 *ARMOR* article on future smart munitions. Like a fish stuck on a trout line, I snapped at his call to explore tactical ramifications of the new ammunition's use. The result is this article's bottom line: a digital tank platoon in the defense, using Smart, Target Activated, Fire and Forget (STAFF) ammunition, can destroy an attacking motorized rifle battalion (MRB). Read that as an **11.5:1** kill ratio. Further, the digital platoon can do so with less than one basic load of ammunition and still retain at least 1800 meters of standoff distance from the lead enemy element. Given some assumptions, this theory can be proved both in time and space.



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Assumptions

Using the acronym METT-T as our guide, here are the assumptions necessary to set the scene that makes the above theory possible:

MISSION. A digital tank platoon must defend a battle position to allow no penetration of the phase line to their rear by the first MRB to enter their sector.

ENEMY:

- The attacking MRB is BMP and T-72 equipped, is at 100% strength and executes standard Threat doctrine.
- The MRB is in battle formation with motorized rifle companies (MRCs) in pre-battle formations, two MRCs forward and one back.
- MRB elements move at a constant speed of 20 kilometers per hour (or 20,000 meters every 3600

seconds).

- The MRB maintains maximum doctrinal intervals (50 meters between vehicles, 300 meters between platoon columns and 800 meters between MRC formations).
- For purposes of this article, enemy air is not introduced.

TIME (AND SPACE):

- All tanks in the digital platoon fire at a constant rate of one round every nine seconds.
- We want to spread out our platoon as far as possible so that the flank tanks begin engagements four kilometers from the lead, flank vehicle of the far, opposite MRC. (See Figure 1.)
- Do not let any enemy vehicles closer than 1800 meters.

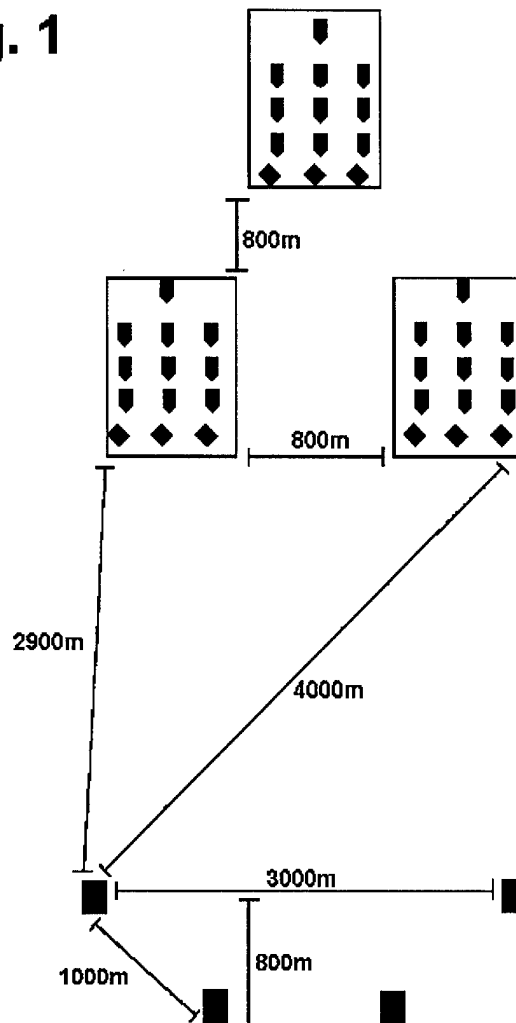
TROOPS AND EQUIPMENT:

- We lead an M1A2 tank platoon at 100% strength.
- Each tank has a combat load of 40 STAFF rounds.
- All tanks have a proper boresight.
- No tanks experience a weapon system malfunction.
- No tanks in the platoon are lost to enemy fire during the engagement.
- We will engage lead MRCs by section with a cross pattern of fire and the trail MRC by platoon frontal pattern of fire.
- STAFF rounds kill with a constant 40% probability of kill (.4 Pk) over any distance out to 4000 meters.
- Enemy locations are initially reported by intelligence assets forward of our platoon and downloaded onto our IVIS.

TERRAIN. The enemy avenue of approach is approximately four kilometers wide, allowing the enemy to maintain formations.

Doing the Math

Looking at Figure 1, several factors become obvious. First, the MRB is deployed with two MRC's forward and one back. There are 800 meters between the inside flanks of the lead MRCs and the same distance from the rear of those MRCs to the front of the trail one (per above assumptions).

Fig. 1

Second, straight-line distance from our digital platoon to the nearest MRC is 2900 meters when we open the engagement. Defensive placement, however, is designed for engagement by tank section in a cross pattern of fire, with a goal of spreading out as far as possible for force preservation. Since engagement range must be within 4000 meters, the outside (flank) tank in each section must be able to range 4000 meters to the outside flank of the opposite MRC; the inside wingman must be able to fire no farther than 4000 meters to the MRC's center mass. Our platoon battle position (BP) enjoys a frontage of 3000 meters, a depth of 800 meters and 1000 meters between tanks! Presently, we do not use this as doctrine. But with an open mind, you can discern the following:

- Platoon tanks will still 'see' each other via their Commander's Integrated Display.
- This is an excellent example of mass as defined at the head of "Direct Fire Planning" (*ARMOR*, November-December 1993). *"Massing of fires is not all 14 vehicles destroying one target. True massing of fires is 14 vehicles destroying 14 different targets...."*
- So dispersed, our platoon is a very demanding artillery target, increasing force protection (nearly impossible to take out without precision weapons or using MRLS-type systems).

But what about time and space? To prove the hypothesis, we must answer this key question:

An MRC with a tank platoon forward has 15 combat vehicles moving one kilometer every three minutes (or 1000 meters every 180 seconds). If we fire two STAFF rounds every nine seconds with a .4 Pk, how long will it take to destroy the MRC and how close will it get to our BP?

This problem is not as daunting if we take it one bite at a time. First, we must determine how many rounds it takes to destroy the MRC:

$$[X \text{ (rounds)}] [.4 \text{ (Pk)}] = 15 \text{ (kills)}$$

$$X = 15/.4$$

$$X = 37.5 \text{ (or 38 for safety's sake)}$$

This tells us how many rounds it takes to destroy the MRC, and we know we can fire two rounds every nine seconds with our method of engagement. Next, we must determine how long it will take to destroy the MRC:

$$\begin{aligned} & \frac{38 \text{ rounds}}{2 \text{ rounds/9 seconds}} = \\ & \frac{38 \text{ rounds} \times 9 \text{ seconds}}{2 \text{ rounds}} = \\ & \frac{342 \text{ rounds/seconds}}{2 \text{ rounds}} = 171 \text{ seconds} \\ & \text{(or 2 minutes, 51 seconds)} \end{aligned}$$

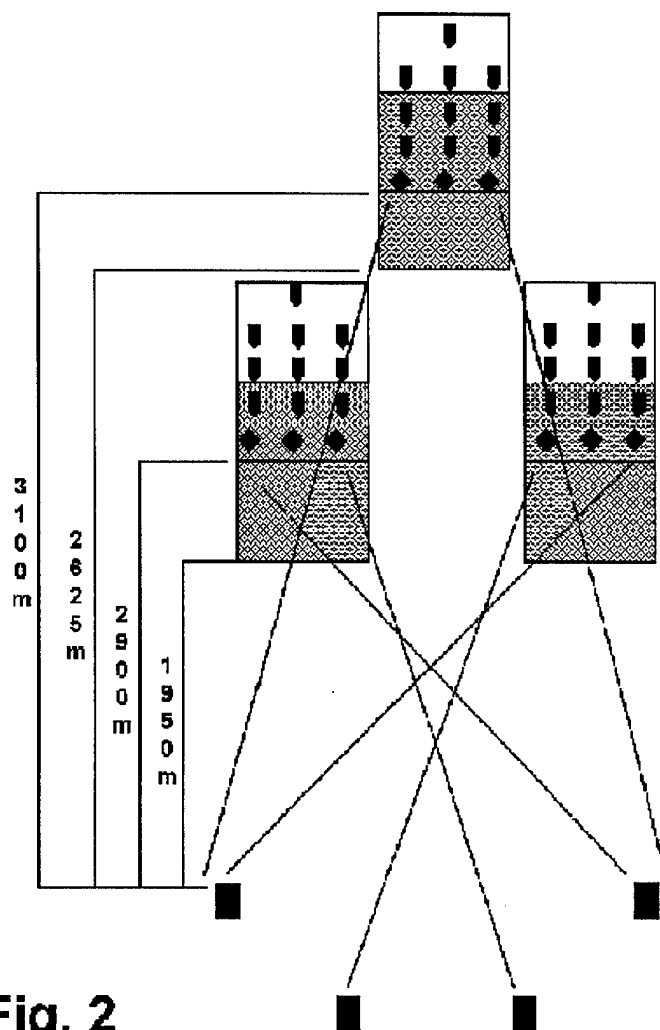
With the time to destruction known, we can calculate how far the MRC advances in that amount of time:

$$\begin{aligned} \frac{20,000 \text{ meters}}{3600 \text{ seconds}} &= \frac{X \text{ meters}}{171 \text{ seconds}} = \\ \frac{3,420,000 \text{ meters seconds}}{3600 \text{ seconds}} &= X \\ X &= 950 \text{ meters} \end{aligned}$$

So, we have the following answer to our question: at an expenditure of 19 rounds per tank, a digital platoon can destroy an MRC in 2 minutes, 51 seconds and not allow them to advance more than 950 meters. Simple subtraction then tells us the closest any of the lead MRC's vehicles will come to our platoon is 1950 meters.

But what about the trail MRC? After destruction of the lead MRCs, the trail MRC has advanced to within 3100 meters of our platoon. We would then change our method of fire distribution to a platoon frontal pattern. With four tanks firing on this MRC, its destruction occurs twice as fast as that of either lead MRC. For an additional 10 rounds per tank, in 1 minute, 26 seconds and within 475 meters, this MRC is eliminated 2625 meters from our BP.

All told, the entire MRB is destroyed in less than 4½ minutes with 29 STAFF rounds per tank. (See Figure 2 - destruction of the MRB is indicated by shaded boxes.) But does this hold for other formations?

**Fig. 2**

MRB in a Column, MRCs in Pre-Battle

Here, our platoon's task is easier. If the enemy remains in column, an MRC is destroyed every 86 seconds/475 meters. (The MRB dies in 4 minutes, 20 seconds.) But surely, no one is that ignorant. So, if each trail MRC deploys around an opposite flank of the lead, dead MRC, we have our original example in reverse. The lead MRC expires in 86 seconds/475 meters, and the remaining two in an additional 2 minutes, 51 seconds/950 meters. (If we open the engagement at 4000 meters with our platoon on line, the enemy never gets closer than 2575 meters.)

If the MRB commander deploys his two remaining MRCs around the same flank of the lead MRC, we have the same type of engagement as if he remained in a column of MRCs, except that we must shift our platoon's fires.

The above examples imply that the greater the depth of the enemy formation, the easier our task becomes. So what happens if the MRB chooses the formation with the least depth?

MRB with MRCs On Line in Pre-Battle

This would be our platoon's most difficult task. If we maintain a cross pattern of fire, this means our flank tanks initially engage opposite MRCs by themselves, while their inside wingmen concurrently engage the center MRC. (See Figure 3.) To engage in this method, our BP frontage shrinks to 1000 meters, with a depth of 100 meters and 325 meters between tanks. Engaging the enemy as expressed above yields their destruction in the following manner:

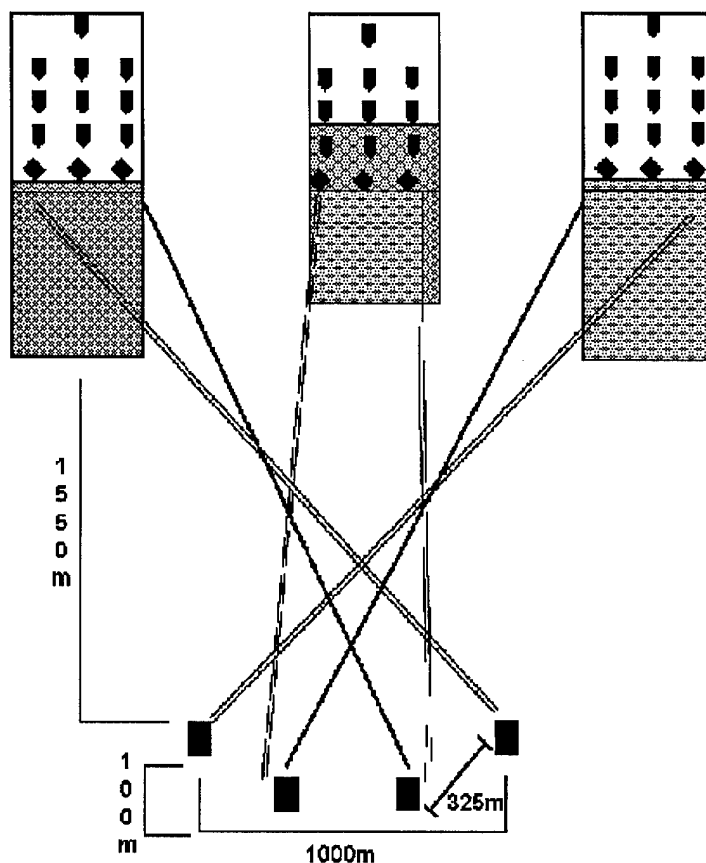


Fig. 3

We open the engagement with the enemy lead element at a three kilometer straight line distance from our flank tanks. After 2 minutes, 51 seconds/950 meters, the center MRC is destroyed with 19 rounds per inside tank. Our flank tanks have destroyed seven enemy vehicles each with 19 rounds within the same 950 meters. The inside tanks now shift to a cross pattern of fires by section and complete destruction of the flank MRCs with 10 more rounds per tank in 90 seconds/500 meters. In a total of 4 minutes, 21 seconds/1450 meters, the MRB is destroyed for 29 rounds per tank.

In checking our spatial relationship, however, our flank tanks are within 1550 meters of the enemy if they remain stationary throughout the engagement. The platoon would have to displace to subsequent fighting positions to retain our 1800 meter space cushion from the enemy. This, by definition, changes our mission to a defense in sector. A defense in sector would not necessarily expend more rounds to destroy the MRB. It would, however, take longer, require more battlefield space (depth) for the platoon, greatly limit our platoon's dispersion within the BP and create C2 problems for us not present if they attack us as in the original example. However, in doing the math, you can see that it is still theoretically possible for a digital platoon to destroy an MRB in this formation.

Observations

Our use of smart munitions coupled with digital C2 enhancements in this manner allows us to make certain observations, both from our, and the enemy's, perspective.

Our Digital Force.

- The mathematics of this theory indicates a pronounced correlation between our, and the enemy's, depth and frontage:
 - The greater the enemy's depth and narrower his frontage, the greater our BP depth and frontage, and the lesser battlefield space we require.
 - The shallower the enemy's depth and wider his frontage, the lesser our BP depth and frontage and the greater battlefield space we require.
- For this theory to work, someone or something must be able to constantly spot the enemy, provide BDA, and download enemy positions to our IVIS system.
- An intelligence asset 'handing off' targets to our tanks seems to call for the M1A2 using the POSNAV system to assist with target acquisition.
- After destruction of the MRB, our platoon would have to resupply their combat load of ammunition.
- By extrapolation of the 11.5:1 kill ratio, a tank company can destroy a regiment and a tank battalion a division. (Once the infantry gets a non-line-of-site missile, it has the same capability, except they will need more time and battlefield space due to the limited number of missiles the BFV might carry.)
- There are many tactical ramifications inherent in this theory. I can think of the following:
 - In fighting his company versus a regiment, the commander needs to be prepared to move up his reserve platoon in time to cover the appropriate enemy avenue of approach as soon as 2-10 minutes after destruction of the first two MRBs. This demands that the company commander thinks of his battlespace as deep as we now think for brigades.
 - Since some form of intelligence-gathering asset must cover the company's increased battlespace, we either need more scouts or remotely piloted vehicles (RPVs) forward in sector under the company's control.
 - If the company has RPVs, who controls them? The XO? The first sergeant? A soldier assigned to a new duty position?
 - If a digital platoon forwards a call for indirect fire because he has line of sight to the enemy, something is seriously wrong. This may mean that artillery becomes primarily a counter battery and enemy second echelon element fighter if we defend in this manner.
 - CS and CSS elements need to be prepared to conduct business over a much wider frontage. Does this mean that they need to have beefed-up TO&Es? Do they need more mobile and faster vehicles?

The Enemy's Perspective.

- Because of the problems it causes us, is the enemy likely to attack with three elements forward and none back in their first echelon?
- Is the enemy more likely to attempt to improve the combat speed of his vehicles in order to provide the means to close the distance with our forces faster?
- Because of the STAFF round's footprint, is the enemy less likely to spread out his formations? (Doing so may make targeting his vehicles easier due to less ground clutter or less of a need to choose between multiple targets within the footprint.)
- Because of the destructive capabilities of digital units with smart ammunition, will the enemy be encouraged to use more obscurants, directed energy weapons or even weapons of mass destruction to achieve his aims?
- Because our electronic intelligence-gathering assets are designed in large measure to find vehicles, will the enemy use more dismounted infantry to set up the conditions for success of his mechanized forces?

Conclusion

Amazingly, our new digital systems coupled with the use of smart munitions may allow us to defend against an enemy at an 11.5:1 ratio. This is truly a technological revolution that provides us with several tactical advantages and the enemy with multiple dilemmas to solve. I believe the possibilities presented in this article equate to deterrence. You cannot find deterrence in any of our Mission Training Plans at any level. But deterrence, being a more noble and much more demanding task to master, is preferable to the expense of blood on any battlefield.

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